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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/682,486

10/10/2003

Pankaj B. Shah

ARL 03-19

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02/17/2005

OFFICE OF COMMAND COUNSEL,
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EXAMINER

NGUYEN, THANH T

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 02/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/682,486

Applicant(s)

SHAH, PANKAJ B.

Examiner

Thanh T. Nguyen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-12, 14-21 and 23-26 is/are rejected.
- 7) ☒ Claim(s) 4, 13 and 22 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/10/03.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: ____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 10/10/03 has been considered.

Oath/Declaration

Oath/Declaration filed on 10/10/03 has been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 5, 9-11, 14, 17-20, 25-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Jiang et al. (U.S. Publication No. 2005/0007670).

Jiang et al. teaches a method of producing a field emission device comprising:

A group III-nitride semiconductor layer over a substrate (see paragraph# 48);

Placing a mask (photoresist) over the group III-nitride semiconductor layer (see paragraph# 48);

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Patterning a generally circular grid in the mask and the group III- nitride semiconductor layer (see paragraph# 48);

Forming the group III-nitride semiconductor layer into generally pointed tips using an inductive couple plasma dry etching process (see paragraph# 48, 57, figure 5a-5c);

Wherein the group II-nitride semiconductor layer comprises a group III-nitride semiconductor material having a negative electron affinity (GaN/AlN, see paragraph# 48).

Regarding to claims 2, 11, 20, anisotropic etching (see paragraph# 48).

Regarding to claims 5, 14 GaN/AlN (see paragraph# 48).

Regarding claims 9, 17, 26, chlorine gas (see paragraph# 48).

Regarding to claim 25, photoresist mask (see paragraph# 48).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 6-8, 12, 15-16, 21, 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (U.S. Publication No. 2005/0007670) as applied to claims 1-2, 5, 9-11, 14, 17-20, 25-26 in view of Chowdhury et al. (U.S. Publication No. 2004/1489173).

Jiang et al. teaches a method of producing a field emission device comprising:

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A group III-nitride semiconductor layer over a substrate (see paragraph# 48);

Placing a mask (photoresist) over the group III-nitride semiconductor layer (see paragraph# 48);

Patterning a generally circular grid in the mask and the group III- nitride semiconductor layer (see paragraph# 48);

Forming the group III-nitride semiconductor layer into generally pointed tips using an inductive couple plasma dry etching process (see paragraph# 48, 57, figure 5a-5c);

Wherein the group II-nitride semiconductor layer comprises a group III-nitride semiconductor material having a negative electron affinity (GaN/AlN, see paragraph# 48).

However, Jiang et al. does not teach inductively coupled plasma dry etching process creates an isotropic etch in the group III-nitride semiconductor creating generally pointed ends on the group III-nitride semiconductor, the inductively coupled plasma dry etching process comprises a four-step etch process, the specific thickness range.

Referring to figures 1-6, Chowdhury et al. teaches a method for fabricating a field emitter tip, comprising:

Positioning a group III-nitride semiconductor (15/16) over a substrate (12);

Patterning the group III-nitride semiconductor using a photoresist masked array (see paragraph# 64); and

Shaping the group III-nitride semiconductor into the field emitter tip (20, see figure 1).

The inductively coupled plasma dry etching process creates an isotropic etch in the group III-nitride semiconductor layer (see figure 1, isotropic etch means that etching in all direction at the same rate).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to shaping the group nitride layer by using inductively coupled plasma dry etching process creates an isotropic etch in the group III-nitride semiconductor layer in process of Jiang et al. as taught by Chowdhury et al. because the process is known in the art to provide a pointed tip for the emitter.

It would be obvious to one ordinary skill in the art to etch the semiconductor layer four times with the same etching process to form a pointed emitter tip since it is well-known in the art to repeat the same process for multiple effect. See *St. Regis paper, Co. V. Bemis Co. Inc.* 193 USPQ 8, 11 (7th circuit 1977).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to etch the layer by using inductively coupled plasma dry etching process comprises a four-step etch process in process of Jiang et al. to repeat the same process for multiple effect to form a pointed emitter tip.

It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the concentration of hydrogen within the dielectric layer, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e.-photoresist layer, radius of curvature), discovering the optimum or workable ranges involves only routine skill in the art. In *re Aller*, 105 USPQ 233 (CCPA 1955).

The specification contains no disclosure of either the critical nature of the claimed arrangement (i.e.- wherein the thickness of photoresist layer, radius of curvature) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the applicant must show that the

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chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (FED. Cir. 1990).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a photoresist layer with a specific thickness and the radius of curvature of the tip in process of Jiang et al. because determining the optimum range of thickness and curvature for the layer only involved routine skill in the art.

Allowable Subject Matter

Claims 4, 13, 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

None of the prior art teaches or suggests inductively coupled plasma dry etching process creates an anisotropic deep etch in the group III-nitride semiconductor followed by an isotropic etch in the group III-nitride semiconductor creating generally pointed ends on the group III-nitride semiconductor.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by

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Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).

A handwritten signature in black ink, appearing to read 'Thanh', with a long horizontal stroke extending to the left and a smaller loop to the right.

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800